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Investigations on Scale Insects (*Homoptera, Coccoidea*) of the Pieniny Mountains

Badania nad czerwcami (*Homoptera, Coccoidea*) Pienin

Исследования кокцид (*Homoptera, Coccoidea*) Пенин

The fauna of scale insects on the territory of the Pieniny has not hitherto been investigated. Only KAWECKI gave 8 species in his works (1938, 1948, 1955, 1957, 1958, 1958 a) and ŻAK-OGAZA pointed out a further 9 (1961). As the result of the recently carried out research it was possible to establish the appearance of all the species already described [with the exception of *Porphyrophora polonica* (L.)] as well as 20 new ones of which 12 had not been noted in the Polish fauna. Altogether 37 species of scale insects were registered on the territory of the Pieniny Mountains.

Due to the fact that Professor Z. KAWECKI made his collection available to the present authors for investigation — for which they would like to express their gratitude to him — they give not only the localities determined during their own research, but also a number of localities which have not yet been published by KAWECKI; thus the picture of the settlements of scale insects on the territory of the Pieniny is fuller.

AN ATTEMPT AT CHARACTERIZATION OF THE FAUNA OF SCALE INSECTS IN THE PIENINY MOUNTAINS

The Pieniny Klippen Belt is formed of Jurassic Cretaceous limestone klippes. It consists of a number of limestone rocks and huge stones set in the sandstone and shales. This belt is divided by rivers which form characteristic gorges. The middle part of the Klippen Belt is the highest and most differentiated part

of the whole Belt. The River Dunajec divides it into three sections i. e. the Spiskie Pieniny Range, the Pieniny, and the Małe Pieniny (Small Pieniny).

The present paper presents the scale insects of the Pieniny Mountains, i. e. the mountain range from Czorsztyn eastward to Szczawnica. This area is divided from the east, west, and south by the river Dunajec, and from the north by the valley of Krośnica and includes the Pieniny Czorsztyńskie, the massif of Trzy Korony (Three Crowns) and the Pieninki (Smólski 1955). The two remaining ranges of the middle part of the Klippen Belt namely the Pieniny Spiskie and the Małe Pieniny, require separate research and these territories will be investigated in the near future.

The mild and warm climate, the asymmetry of the rocks of the Pieniny (the northern slopes are very gentle but the southern ones very steep and exposed to the sun) and the not very great absolute height — all these factors are important for the development of the flora and fauna of the Pieniny. The vegetation of this region is characterized by a very wide variety of species and a comparatively large number of endemites. The fauna has not yet been investigated thoroughly, scale insects being among the groups not yet elaborated. The number of 37 scale insects species from the Pieniny may seem relatively low but it is 55% of the determined scale insects from the territory of Poland.

It should be mentioned that the authors dealt mainly with scale insects appearing in the natural environment of the Pieniny. However, in Czorsztyn, Krościenko and Sromowce Wyżne a number of species of scale insects connected with human cultivation were found. They were the following: *Lecanium corni* Bouché, Marchal (♀ nec ♂), *Lecanium coryli* (L.) sensu Marchal nec Šulc, *Sphaerolecanium prunastri* (Fonsc.), *Chionaspis salicis* (L.), *Lepidosaphes ulmi* (L.), Quadrasapidiotus ostreaeformis (Curt.) and Phenacoccus aceris (Geoffr.). They are very common on the whole territory of Southern Poland. All these species, with the exception of *Phenacoccus aceris* (Geoffr.) were also found on the actual territory of the Pieniny but only on a small number of host plants and in small population, the exception being *Chionaspis salicis* (L.) very common in the Pieniny Mountains.

Taking into consideration the great dependence of scale insects on host plants there can be differentiated in the Pieniny a group of species connected with forest plants and a group of scale insects living on the plants of meadows, clearings and rocky slopes.

The forests of the Pieniny are in the range of the lower mountainous forest (the highest peak 982 m) so consist chiefly of firs and beeches. Only one species of scale insect is connected here with the beech i. e. *Cryptococcus fagisuga* Lndgr. It appears commonly in the Pieniny as well as in the whole territory of Poland in the range of appearance of the beech. But a much greater number of species of scale insects live on firs. Of monophagous species *Lecanium graniforme* (Wünn) and *Lecanium sericeum* Lndgr. are found; both these species were found in only a few localities in the Pieniny. Of polyphagous species also

living on fir *Dynaspidiotus abietis* (SCHRK.) and *Lepidosaphes ulmi* (L.) were registered but also only in a few localities.

Another element forming the forest of the Pieniny Mountains are groups of fir and spruce. On the spruce the appearance of 5 species of scale insects were observed. *Physokermes piceae* (SCHRK.), was found on one, though very rich locality (for a number of years one tree attacked by this scale insect was observed there being no sign of its moving to the nearby spruce trees) and *Physokermes hemicryphus* (DALM.) was encountered much more often. The next three species living on the spruce are: *Syngenaspis parlatoriae* ŠULC, *Dynaspidiotus abietis* (SCHRK.) and *Paroudablis piceae* (LÖW.). The sporadic appearance of these scale insects in the investigated area may be explained by the fact that the spruce is here a foreign element introduced by man. It may be assumed that on the territory of the Małe Pieniny where there exist a natural spruce forest with its characteristic undergrowth, scale insects living on spruce have more advantageous conditions for their development.

The authors were unable, in spite of intensive search, to find any scale insects connected with the pine tree, although in other parts of southern Poland there appear on pines species from the genera *Leucaspis* TARG., *Lepidosaphes* SCHIMER and *Dynaspidiotus abietis* (SCHRK.). Nor did the research carried out on junipers bring any result and the species living on them i. e. *Pseudococcus vovae* NASS. and *Carulaspis visci* (SCHRK.), were not found although their host plants are very common in the whole area of the Pieniny. It may be assumed that these two species do not appear in the territory of the Pieniny Mountains. However the absence of such scale insects as *Phyllostroma myrtilli* (KALT.) and *Lecanium slavum* KAW. seems to be explained by the very few stands of their host plants i. e. *Vaccinium myrtillus* L. and *V. vitis-idaea* L. It may be assumed that these scale insects appear in the Małe Pieniny where in the natural spruce forest both plants grow abundantly (KULCZYŃSKI 1928).

On the clearings formed by cutting trees and landslides grow sycamore, maple, linden, elm, and hornbeam. On the banks of rivers and streams, by the roads and meadows or clearings grow alder, hazel, willow, mountain ash, wild rose and sloe. It is very interesting to find the appearance of *Xylococcus filiferus* LÖW on *Tilia cordata* MILL. growing on the sunny ridge of Czertezik (this locality was found by KAWECKI in 1936 and still exist). *Xylococcus filiferus* LÖW lives in very similar localities in Ojców and the Góry Świętokrzyskie range (KAWECKI 1948). Another interesting fact is the common appearance on sycamores of *Acanthococcus aceris* SIGN. a species found in Poland hitherto only in the neighbourhood of Miechów, Żegiestów and in the Sudety. On the other trees and bushes mentioned above we encounter scale insects common in Southern Poland. They are above all such species as *Lecanium corni* BOUCHÉ, MARCHAL (♀ nec ♂), *Lecanium coryli* (L.) sensu MARCHAL, *Sphaerolecanium prunastri* (Fonsc.) and *Pulvinaria betulae* (L.). It is a characteristic fact observed in the last few years that the population of some of these species has been diminishing, e. g. *Lecanium corni* BOUCHÉ, MARCHAL and *L. coryli* (L.)

sensu MARCHAL. This is probably the result of the spread of their natural enemies, chiefly the parasitic chalcids. A species appearing in great numbers and on many host plants [*Salix* L., *Rhamnus* L., *Cornus* L., *Populus* L. *Acer* L., *Sorbus aucuparia* (L.)] is *Chionaspis salicis* (L.). However two species, namely *Gossyparia spuria* (MOD.) and *Aulacaspis rosae* (BCHÉ.) which might be expected to live in the Pieniny were not found there. *G. spuria* (MOD.) is quite common on the elm in the whole of Southern Poland; *A. rosae* (BCHÉ.) was determined only on the wild rose in Pińczów and Sandomierz but favourable conditions for the development for this species led to the assumption that it should appear in the Pieniny.

Relatively interesting results were obtained from the research on clearings, meadows, and plants growing on rocks. Scale insects were collected on meadows and clearings after mowing. This facilitated collection but on the other hand made it impossible in several cases to determine the host plant. Part of the meadows and clearings in the Pieniny are used for cattle and sheep grazing after haymaking this being distinctly reflected in the quantitative and qualitative composition of the fauna of scale insects. A good example of this might be a small meadow in the neighbourhood of Podzamcze (the Pieniny Czorsztyńskie) situated at about 560 m over sea level. On a comparatively small area several species of scale insects were found i. e. *Ceroputo pilosellae* ŠULC, *Heliococcus radicicola* GOUX, *Rhizococcus insignis* (NEWST.) and *Luzulaspis montana* SCHMUTTERER, while on other meadows in the vicinity there were none of these species. The differences in the quantitative appearance of particular scale insects could be shown on the example of settling of *Ceroputo pilosellae* ŠULC. This species lives on the meadow mentioned above on many species of host plants and is very numerous; on a meadow used for grazing in the valley of Głęboki Potok were found only single specimens; it appeared again in large numbers in the valley of Pieniński Potok (strict reserve) and only sporadically on the pastured Podłaźce.

A clearing under Ociemny Wierch (the Pieninki range, 610—700 m over sea level) was very interesting as the appearance of a large group of scale insects was determined. The species were: *Luzulaspis luzulae* (DUFOUR), *Eriopeltis festucae* (FONSC.), *Parafairmairia bipartita* (SIGN.), *Rhizococcus insignis* (NEWST.), *Rh. herbaceus* DANZIG and *Paroudablis interruptus* (GREEN), the two first species and *Rh. insignis* (NEWST.) appearing in large numbers. Almost all these species were found later on other clearings in the Pieniny but not in such quantity and they did not form a compact group as in the clearing under Ociemny Wierch. The appearance of a similarly compact group on the territory of the Gorce range allows the assumption that this group is characteristic for the clearings situated in the woods of the lower mountainous forests.

There follow scale insects living in other environments. On the sunny southern slopes covered by xerothermic plants with the predominance of *Calamagrostis* ADANS. were found *Acanthococcus greeni* (NEWST.), *Greenisca inermis* (GREEN) and *Luzulaspis grandis* BORCHS. The two former species were observed only

sporadically but the locality of *Greenisca inermis* (GREEN) under Długi Gronik (in the Pieninki range) was very rich. On the xerothermic area with the predominance of *Festuca* L. two species were found i. e. *Brevennia tetrapora* GOUX and *Greenisca glyceriae* (GREEN).

Ortheziola vejdovskyi ŠULC and *Newsteadia floccosa* DE GEER. may be classified as species widely spread over the area of the Pieniny. *O. vejdovskyi* ŠULC being found always on moss on dry territories and *N. floccosa* DE GEER on moss on damp territories.

As results from the authors' observations neither *Orthezia urticae* (L.) a species common in Poland nor *Arctorthezia cataphracta* (OLAF.) appear in the Pieniny. *A. cataphracta* (OLAF.) lives in an environment very similar to the Pieniny one, in moss covering limestone slopes in the Western Tatras (KAWECKI 1938).

KUNTZE (1934) in his work „The Zoogeographical Problems of the Pieniny Mountains" differentiated three groups of animals characteristic for the Pieniny: 1) appearing exclusively in the Pieniny, 2) appearing in the Podole region and the Pieniny, 3) appearing in Southern Poland but not in the Carpathians. It seems premature to draw any conclusions as to the geographic range of the described scale insects because of a lack of physiographic data both from the territory of Poland and from the neighbouring countries.

LIST OF SPECIES

In the present work the localities previously described by KAWECKI and ŻAK-OGAZA are not repeated [with the exception of *Porphyrophora polonica* (L.)]. The name of the collector is omitted when the locality was found by the authors. The geographic names of the Pieniny are given according to the map „Pieniny" (photogrametric map 1: 20 000, Warszawa 1937). The names of host plants are given according to the key „Rośliny polskie" (Polish Plants) by W. SZAFER, S. KULCZYŃSKI, B. PAWŁOWSKI, 1953. The data concerning particular species of scale insects are given as follows: host plant, location (abbreviation loc.), date of collection.

Family: *Margarodidae*

1. *Xylococcus filiferus* LÖW

host: *Tilia cordata* MILL.

oc.: Czertezik (the Pieninki), 8 June 1963, numerous ♀♀.

This species was already reported from the Pieniny by KAWECKI (1948) and ŻAK-OGAZA (1961) also observed on the Czertezik mount. During the present research no new location was found. In Poland it appears in Ojców and the Góry Świętokrzyskie range (KAWECKI 1948).

The species has been observed only in Austria and Switzerland (LINDINGER 1912), in Germany (WÜNN 1925) and Czechoslovakia (ZAHRADNIK 1959).

2. *Porphyrophora polonica* (L.)

Males of the species were collected in 1910 in Krościenko by S. Smreczyński Sr. (Kawecki 1948). During the present research the authors were unable to find it.

The chief host plant of *P. polonica* (L.) is *Scleranthus perennis* L. The scale insect is widely spread in Poland and the whole of Europe.

Family: *Orthezìidae*

3. *Newsteadia floccosa* de Geer

host: *Musci* (underground parts)

loc.: Toporzyska, 13 Aug. 1963 — numerous ♀♀; Czorsztyn, 18 Sept. 1963 — numerous ♀♀; Upszar (the Pieniny Czorsztyńskie), 19 Sept. 1963 — 2 ♀♀; Wielka Dolina (by the Przełęcz Szopka pass), 20 Sept. 1963 — 1 ♀.

This species has not been reported from the Pieniny. In Poland it appears in the Tatra Mountains and the Puszcza Białowieska forest, where it was also found on the underground parts of mosses (Kawecki 1938). It is quite common in Europe.

4. *Ortheziola vejdovskyi* Šulc

Some authors (i. e. Morrison 1952) think that this species is synonymous with *O. signoreti* (Hall.) but the matter has not as yet been clarified. In the present paper the commonly used name *O. vejdovskyi* Šulc is retained.
host: *Musci*, *Gramineae*

loc.: Długi Gronik (the Pieninki), 7 July 1963 — numerous ♀♀; the clearing under Ociemny Wierch (the Pieninki), 13 Aug. 1963 — numerous ♀♀; Toporzyska, 13 Aug. 1963 — 2 ♀♀.

The species is new for Poland. In Europe it was determined in Czechoslovakia (Šulc 1894, Zahradnik 1959), in England (Newstead 1903), Switzerland (Lindinger 1912), France (Goux 1934), and in Germany (Schmutterer 1952).

Family: *Pseudococcidae*

5. *Phenacoccus aceris* (Geoffr.)

host: *Tilia cordata* Mill. and *T. platyphyllos* Scop.
loc.: Kras (the Pieninki), 7 July 1963 — numerous dead ♀♀ and first instar larvae; Czorsztyn, 18 Sept. 1963 — numerous dead ♀♀ and second instar larvae.

host: *Fraxinus excelsior* L., *Aesculus hippocastanum* L., *Acer platanoides* L.

loc.: Czorsztyn, 18 Sept. 1963 — numerous dead ♀♀ and second instar larvae.

This species has not yet been reported from the Pieniny. It is a polyphagous species, common in Poland and throughout Europe.

6. *Paroudablis piceae* (Löw)

host: *Picea excelsa* (Lam.) Lk.

loc.: Pieniński Potok, 25 June 1963 — 1 young ♀ on needles; Długi Gronik (the Pieninki), 7 July 1963 — several ♀♀ just before oviposition; Czorsztyn, 18 Sept. 1963 — dead ♀♀ and second instar larvae; Podłaźce (the massif of Trzy Korony), 20 Sept. 1963 — second instar larvae on a tree trunk.

The species has already been reported from the Pieniny Żak-Ogaza 1961). In Poland it has been observed in Słomka (district Limanów) and in Ojców as *Phenacoccus piceae* Löw (Kawecki 1935). As monophagous species it has so far been found in Switzerland and Austria (Lindinger 1912), in Germany (Schmutterer 1952), Czechoslovakia (Zahradnik 1959) and in the European territory of the Soviet Union (Borchsenius 1949).

7. *Paroudablis interruptus* (Green)

host: *Agropyron* sp.

loc.: Clearing under Ociemny Wierch (the Pieninki), 8 June 1963 — 3 young ♀♀.

This species has not been reported from Poland. In Europe it has been found in England (Green 1923), in the Soviet Union — in the Ukraine and Armenia (Borchsenius 1949). The main host plants of this scale insect are species from the genera *Agropyron* Gaertn. and *Elymus* L.

8. *Heterococcus borkhsenii* Morr.

host: *Gramineae* (in leaf sheath)

loc.: Pieniński Potok (on saturated meadow), 24 June 1963 — 1 ♀ in ovisac after oviposition.

This species is new for Polish fauna. It was described by Morrison in 1945. In the Soviet Union (Province Tombovskij, Ukraine and Northern Caucasus) it was found on *Dactylus* sp. and *Agropyron repens* (L.) P. B. (Borchsenius 1949).

9. *Brevennia tetrapora* Goux

host: in leaf sheath of *Agrostis* sp.

loc.: Długi Gronik (the Pieninki) on a dry meadow, 7 July 1963 — 1 ♀ in ovisac during oviposition.

This species is new for Poland. It was described in 1940 in France on *Agrostis* sp. (Goux 1940) and has not been determined anywhere else.

10. *Heliococcus radicicola* Goux

host: *Thymus* sp.

loc.: Podzamcze (Czorsztyn), damp meadow, 18 Sept. 1963 — second instar larvae.

This species has never been found in Poland. It was described in France in 1931 (Goux) and later observed in the Crimea (Borchsenius 1949) and in Germany (Schmutterer 1952).

Among the established host plants of this species are those of the genera *Dianthus* L., *Thymus* L., *Taraxacum* Zinn., *Rumex* L., and others.

11. *Ceroputo pilosellae* Šulc

host: *Carex* sp.

loc.: Pieniński Potok (on saturated meadow), 24 June 1963 — 3 ♀♀ at the moment of parturition; Podzamcze (Czorsztyn), 18 Sept. 1963 — numerous second instar larvae.

host: *Thymus* sp.

loc.: Podzamcze (Czorsztyn), 18 Sept. 1963 — numerous second instar larvae; Potok Głęboki (the Pieniny Czorsztyńskie), damp meadow, 19 Sept. 1963 — 2 second instar larvae, Podłaźce (massif of Trzy Korony), dry meadow, 20 Sept. 1963 — 1 second instar larva.

host: *Plantago media* L., *P. lanceolata* L., *Hieracium* sp., *Taraxacum officinale* Web.

loc.: Podzamcze (Czorsztyn), 19 sept. 1963 — very numerous second instar larvae.

This species has already been reported from the Pieniny, and the Beskid Wyspowy and Beskid Sądecki ranges as well as from Cracow (Kawecki 1948). Besides Poland it has been observed in Czechoslovakia (Šulc 1897, Zahradnik 1959), Switzerland (Lindinger 1912), Alsace (Wünn 1926), the Crimea and later the Caucasus and Transcaucasia (Borchsenius 1949).

Family: *Eriococcidae*

12. *Acanthococcus aceris* SIGN.

host: *Acer pseudoplatanus* L.

loc.: Doliny (The Pieniny Czorsztyńskie), under Ociemny Wierch (the Pieninki), 8 June 1963 — numerous ♀♀ before and during oviposition; under Białe Skałki (the Pieninki), 26 June 1963 — numerous ♀♀ after oviposition; Wielka Dolina (the Pieniny Czorsztyńskie), 20 Sept. 1963 — dead ♀♀ and second instar larvae.

This species has not been reported from the Pieniny. KAWECKI (1957) collected it in Niedźwiedź near Miechów, in Żegiestów and in the Sudety Mountains. The known host plants of this coccid are species from the genera *Acer* L. and *Aesculus* L. It is wide spread in Europe.

13. *Acanthococcus greeni* (NEWST.)

host: *Calamagrostis* sp.

loc.: Długi Gronik (the Pieninki), 7 July 1963 — 1 ♀ in ovisac after oviposition; under Upszar (the Pieniny Czorsztyńskie), 18 Sept. 1963 — 1 ♀ dead in ovisac.

These are the first certain locations in Poland. (The species is mentioned in the BORCHSENIUS' Key from 1949 as existing in Poland but without specifying the location or source). *A. greeni* (NEWST.) has been reported only from England (NEWSTEAD 1898), France (GOUX 1933) and the Soviet Union, namely Armenia and the Ukraine (BORCHSENIUS 1949). In France it was collected on *Brachypodium* sp. From England and the Soviet Union the host plant was not given.

14. *Rhizococcus insignis* (NEWST.)

host: *Gramineae*, *Carex* sp. sp., *Luzula campestris* (L.), *L. nemorosa* (POLL.) E. MEY.

loc.: Długi Gronik (the Pieninki), 7 July 1963 — 2 ♀♀ in ovisac after oviposition; clearing under Ociemny Wierch (the Pieninki), 13 Aug. 1963 — 10 ♀♀ in ovisac; Podzamcze (Czorsztyn), 18 Sept. 1963 — 3 dead ♀♀ in ovisac; Kąty (the Pieniny Czorsztyńskie), 19 Sept. 1963 — 1 dead ♀.

This species is new for the Pieniny region. In Poland it was only observed in the Gorce range (KOTEJA in print), in Europe it is widespread.

15. *Rhizococcus herbaceus* DANZIG

host: *Gramineae*, *Luzula* sp. sp., *Carex* sp. sp.

loc.: Pieniński Potok, 24 June 1963 — 1 ♀ in ovisac during the oviposition; Długi Gronik (the Pieninki), 7 July 1963 — 2 ♀♀ in ovisac after oviposition; clearing under Ociemny Wierch (the Pieninki), 13 Aug. 1963 — 1 dead ♀ in ovisac.

This species has not been reported from the Pieniny either; in Poland it has been encountered only in the vicinity of Cracow (KOTEJA in print). It is a species separated from *Rh. insignis* (NEWST.) only in 1962 by DANZIG (registered in the vicinity of Leningrad).

16. *Greenisca inermis* (GREEN)

host: *Calamagrostis* sp.

loc.: Długi Gronik (the Pieninki), 7 July 1963 — very numerous older larvae and young females before oviposition.

This species has not been previously reported from Poland. It was investigated in England (GREEN 1920), France (BALACHOVSKY 1934 a), and the Soviet Union (Krasnodar and Western Georgia) (BORCHSENIUS 1949). It lives on grass.

17. *Greenisca glyceriae* (GREEN)

host: *Festuca* sp.

loc.: under Rabsztyn (the Pieniny Czorsztyńskie), 19 Sept. 1963 — 1 ♀ in ovisac after oviposition.

This species has not been previously reported from Poland. Observed in England (GREEN 1921), France (GOUX 1937), Germany (SCHMUTTERER 1952), Czechoslovakia (ZAHRADNIK 1959) and the Soviet Union (neighbourhood of Leningrad, Ukraine, and Crimea) (KIRIČENKO 1931, DANZIG 1959). It lives on numerous species of grass.

18. *Fonscolombia fraxini* (KALT.)

host: *Fraxinus excelsior* L.

loc.: Czorsztyn, 18 Sept. 1963 — very numerous second instar larvae.

The species was reported from the Pieniny (ŻAK-OGAZA 1961); it is wide spread in Europe.

19. *Cryptococcus fagisuga* LNDGR.

host: *Fagus silvatica* L.

loc.: Góra Zamkowa (the massif of Trzy Korony), the Wąwóz Sobczański, the slopes of Sokolica (the Pieninki), 10 Aug. 1936, leg. et det. Z. KAWECKI; Ociemne (the Pieninki), 8 June 1963 — numerous ♀♀.

This species was reported from the Pieniny by ŻAK-OGAZA (1961). It is quite common in the area of the Pieniny. In Poland and in Europe spread in the range of beech.

Family: *Coccidae*

20. *Luzulaspis luzulae* (DUFOUR)

host: *Luzula campestris* (L.), *Carex* sp.

loc.: clearing under Ociemny Wierch (the Pieninki), 13 Aug. 1963 — numerous ♀♀ in ovisac under oviposition; the meadow under Czubata Skałka (the Pieniny Czorsztyńskie), 19 Aug. 1963 — 1 dead ♀ in ovisac; Wielka Dolina (the Pieniny Czorsztyńskie), 20 Sept. 1963 — 1 dead ♀ in ovisac.

This species was not previously reported from the Pieniny. In Poland and in Europe it is widespread.

21. *Luzulaspis montana* SCHMUTT.

host: *Carex* sp.

loc.: Podzamcze (Czorsztyn), damp meadow, 18 Sept. 1963 — third instar larvae and adult females.

A species new for Polish fauna. Described in 1955 by SCHMUTTERER from Germany (the Northern Alps and Bavaria) where it was collected on *Carex* sp. It was also observed in the vicinity of Leningrad (DANZIG 1959) and in Czechoslovakia (ŘEHÁČEK 1960).

22. *Luzulaspis grandis* BORCHS.

host: *Carex* sp.

loc.: Kąty (the Pieniny Czorsztyńskie), 19 Sept. 1963; Macelowa Góra (the Pieniny Czorsztyńskie) 7 Oct. 1963 — 1 dead ♀ in ovisac and 2 ovisacs with eggs.

This species has not previously been reported from Poland. It was described by BORCHSENIUS (1952) on *Carex* sp. (Primorskij Krai) and was then found only in Germany (Upper Franken) (SCHMUTTERER 1952) on the same host plant.

23. *Parafairmairia bipartita* (SIGN.)

host: *Gramineae*

loc.: clearing under Ociemny Wierch (the Pieninki), 13 Aug. 1963 — 3 ♀♀ in ovisac after oviposition.

A species new for Poland. Described by SIGNORET in 1874 from France, it was later only reported from Germany (SCHMUTTERER 1955 a). *Brachypodium silvaticum* (HUDS.) ROEM. et SCHULT. and *Equisetum palustre* L. are its known host plants.

24. *Eriopeltis festucae* (FONSC.)

host: *Festuca* sp.

loc.: clearing under Ociemny Wierch (the Pieninki), 13 Aug. 1963 — numerous ♀♀ in ovisac after oviposition; Podłaźce (the massif of Trzy Korony), 20 Sept. 1963 — 2 dead ♀♀ in ovisac with eggs.

This species has not previously been reported from the Pieniny. In Poland and in Europe it is fairly common; it lives on grass of the genera *Festuca* L., *Agropyron* GOERTN. and *Brachypodium* P. B.

25. *Pulvinaria betulae* (L.)

host: *Corylus avellana* L.

loc.: Góra Zamkowa (the massif of Trzy Korony), 10 Aug. 1963 — 3 ♀♀ leg. et det. Z. KAWECKI; Ociemne (the Pieninki), 13 Aug. 1963 — numerous dead ♀♀ and first and second instar larvae; Piekiełko (the Pieniny Czorsztyńskie), 19 Sept. 1963 — 1 dead ♀ and numerous second instar larvae.

host: *Sorbus aucuparia* L.

loc.: Góra Zamkowa (the massif of Trzy Korony), 9 June 1963 — 1 ♀ during oviposition.

host: *Salix caprea* L.

loc.: Białe Skałki (the Pieninki), 26 June — 1 ♀ after oviposition.

This species has not previously been reported from the Pieniny. It is common in Poland and in Europe.

26. *Sphaerolecanium prunastri* (FONSC.)

host: *Prunus spinosa* L.

loc.: Doliny (the Pieniny Czorsztyńskie), 8 June 1963 — numerous young ♀♀; Kras and Długi Gronik (the Pieninki), 7 July 1963 — numerous ♀♀ and first instar larvae; Czorsztyn, 18 Sept. 1963 — second instar larvae; Podskale (the Pieniny Czorsztyński) — numerous second instar larvae.

This species has been reported previously from the Pieniny (KAWECKI 1957, ŻAK-OGAZA 1961). It is a fairly common species both in Poland and in the whole of Europe.

27. *Lecanium corni* BOUCHÉ, MARCHAL (♀ nec ♂)

host: *Corylus avellana* L.

loc.: Trzy Korony, 5 Oct. 1935 — dead ♀♀, leg. et det. Z. KAWECKI; Wąwóz Sobczański, 10 Aug. 1936 — dead ♀♀, leg. et det. Z KAWECKI; clearing under Trzy Korony, 8 June 1949 — ♀♀, leg. et det. Z. KAWECKI; Ociemne (the Pieninki), 8. June 1963 — ♀♀.

host: *Cornus sanguinea* L.

loc.: clearing under Trzy Korony, 8 June 1949 — ♀♀, leg. et det. Z. KAWECKI.

host: *Prunus domestica* L.

loc.: Krościenko, 8 June 1949 — ♀♀, leg. et det. Z. KAWECKI.

host: *Prunus spinosa* L.

loc.: Doliny (the Pieniny Czorsztyńskie), 8 June 1963 — ♀♀; Kras and Długi Gronik (the Pieninki), 7 July — numerous ♀♀ and first instar larvae; Czorsztyn, 18 Sept. 1963 — second instar larvae; Podłaźce (the massif of trzy Korony), 20 Sept. 1963 — numerous second instar larvae.

host: *Urtica dioica* L.

loc.: Krościenko, 7 June 1951 — ♀♀, leg. et det. Z. KAWECKI.

host: *Rubus* sp.

loc.: clearing under Trzy Korony, 10 Aug. 1936 — dead ♀♀, leg. et det. Z. KAWECKI.

host: *Fraxinus excelsior* L., *Tilia platyphyllos* SCOP., *T. cordata* MILL., *Sambucus racemosa* L., *Viburnum opulus* L., *Mentha* sp.

loc.: Czorsztyn, 18 Sept. 1963 — second instar larvae.

This species has already been reported from the Pieniny by KAWECKI (1958). It is a common species both in Poland and in Europe.

28. *Lecanium coryli* (L.) sensu MARCHAL nec ŠULC

host: *Corylus avellana* L.

loc.: : near Trzy Korony and by the road to Sokolica, 5 Oct. 1935 — ♀♀, leg. et det. Z. KAWECKI; Wąwóz Sobczański, 10 Aug. 1936 — ♀♀, leg. et det. Z. KAWECKI; clearing under Trzy Korony, 8 June 1949 — ♀♀, leg. et det. Z. KAWECKI; Istebki (the Pieninki), 8 June 1963 — ♀♀.

This species has already been reported from the Pieniny (KAWECKI 1958 a). It is a polyphagous species and is known in many localities in Poland. Widespread in Europe.

29. *Lecanium sericeum* LNDGR.

host: *Abies alba* MILL.

loc.: Istebki (the Pieninki), 24 June 1963 — numerous young ♀♀ before oviposition; 13 Aug. 1963 — first instar larvae.

This monophagous species has already been reported from the Pieniny, as well as from the Tatras, Beskid Wyspowy, Śląski, Żywiecki ranges, the Gorce Mts., the Góry Świętokrzyskie Mts. and the Sudety Mts. (KAWECKI 1938, 1955). It appears in Germany (LINDINGER 1912), Czechoslovakia (ZAHRADNIK 1959), in Italy (according to KAWECKI 1955), on Corsica (BALACHOVSKY 1934) and in the Soviet Union (Crimea, Caucasus) (BOCHSENIUS 1950, 1957).

30. *Lecanium graniforme* (WÜNN)

host: *Abies alba* MILL.

loc.: Doliny (the Pieniny Czorsztyńskie), 28 May 1959 — 1 dead ♀, leg. B. ŻAK-OGAZA.

This is also a monophagous species. It was reported by KAWECKI (1957) from the Pieniny (Trzy Korony) and also from Zakopane, the Beskid Wyspowy and Śląski ranges, Babia Góra Mts., and the Góry Świętokrzyskie Mts. In the Pieniny it is very rarely found. During the present research not one locality was found.

This species has been observed in the Southern Alsatian Jura, the southern part of the Canton of Zürich, in the Bavarian Alps (according to KAWECKI 1957) and in Czechoslovakia (ZACHRADNIK 1959, ŘEHÁČEK 1960).

31. *Physokermes piceae* (SCHRK.) **sensu** SCHMUTTERER (1956) **nec** BORCHSENIUS

host: *Picea excelsa* (LAM.) LK.

loc.: Toporzyska, 8 June 1963, numerous young ♀♀ and flying ♂♂.

This species was already reported from the Pieniny (ŻAK-OGAZA 1961). It has been known in Poland from several, though not very rich, localities. It is widespread in the whole of Europe.

32. *Physokermes hemicryphus* (DALM.)

host: *Picea excelsa* (LAM.) LK.

loc.: road to Trzy Korony, 5 Oct. 1935 — ♀♀, leg. et det. Z. KAWECKI; Czorsztyn, 9 Aug. 1936 — ♀♀, leg. et det. Z. KAWECKI; Wąwóz Sobczański, 10 Aug. 1936 — ♀♀, leg. et det. Z. KAWECKI; eastern slopes of Sokolica (the Pieninki), 7 July 1963 — ♀♀ with eggs; Podzamcze (Czorsztyn), 18 Sept. 1963 — dead ♀♀ and second instar larvae.

Ph. hemicryphus (DALM.) was already reported from the Pieniny (ŻAK-OGAZA 1961). It is more common both in the Pieniny and in the whole country than the previously described species. It is also widespread in Europe.

Family: *Diaspididae*

33. *Dynaspidiotus abietis* (SCHRK.)

host: *Abies alba* MILL.

loc.: Toporzyska, 8 June 1963 — 2 ♀♀; Sokolica (the Pieninki), 7 July 1963 — 1 ♀.

host: *Picea excelsa* (LAM.) LK.

loc.: Czorsztyn, 18 Sept. 1963 — numerous larvae and young ♀♀; Podłaźce (the massif of Trzy Korony), 20 Sept. 1963 — numerous larvae and young ♀♀.

This species has already been reported from the Pieniny (ŻAK-OGAZA 1961). It is a species common in Poland and in the whole of Europe. Besides the host plants mentioned above it lives also on *Pinus* L. and *Pseudotsuga* CARR.

34. *Quadraspidiotus ostreaeformis* (CURT.)

host: *Populus nigra* L., *Alnus incana* (L.) MNCH.

loc.: Sromowce Niżne, 20 Sept. 1963 — numerous second instar larvae.

This species was reported from the Pieniny by ŻAK-OGAZA (1961). As a polyphagous species it is one of the scale insects common in Poland and in Europe. In the Pieniny it appears very rarely and it was not observed in the area of the Pieniny range proper.

35. *Syngenaspis parlatoriae* ŠULC

host: *Picea excelsa* (LAM.) LK.

loc.: Podłaźce (the massif of Trzy Korony), 20 Sept. 1963 — numerous ♀♀ before and after oviposition and first instar larvae.

This species, new for Polish fauna, was reported by MIKSIEWICZ from Lwów (1949). In the Pieniny it was found only in one locality though a great number of spruces were searched. It appears in Czechoslovakia (ŠULC 1895, ZAHRADNIK 1959), Yugoslavia (BACHMANN 1952—53), Austria and Germany (SCHMUTTERER 1959), and the Crimea (BORCHSENIUS 1950). It lives on coniferous trees of the genera *Pinus* L., *Picea* DIETR., *Abies* MILL., and *Tsuga* CURR.

36. *Lepidosaphes ulmi* (L.)

host: *Tilia cordata* MILL.

loc.: Wąwóz Sobczański, 10 Aug. 1936 — old ♀♀ with eggs, leg. et det. Z. KAWECKI; the gorge of the Dunajec river in the Pieniny, 19 Aug. 1936 — ♀♀ with eggs, leg. et det. Z. KAWECKI.

host: *Crataegus* sp.

loc.: Długi Gronik (the Pieninki), 7 July 1963 — numerous ♀♀.

host: *Abies alba* MILL.

loc.: Potok Pieniński, 25 June 1963 — second instar larvae.

host: *Corylus avellana* L.

loc.: under Czubata Skałka (the Pieniny Czorsztyńskie), 19 Sept. 1963 — numerous ♀♀ with laid eggs.

host: *Cornus mas* L., *Prunus spinosa* L.

loc.: Czorsztyn, 18 Sept. 1963 — numerous ♀♀ with laid eggs.

This polyphagous species has already beed reported from the Pieniny (ŻAK-OGAZA 1961). It relatively rarely appears there, though it is quite common in Poland and in Europe.

37. *Chionaspis salicis* (L.)

host: *Sorbus aucuparia* L.

loc.: by the road to Góra Zamkowa (the massif of Trzy Korony), 5 Sept. 1935 — ♀♀, leg et det. Z. KAWECKI; Góra Zamkowa, 9 June 1963 — first and second instar larvae; Potok Pieniński, 25 June 1963 — first and second instar larvae.

host: *Alnus incana* (L.) MNCH.

loc.: by the road to Trzy Korony, 10 Aug. 1936 — numerous ♀♀, leg. et det. Z. KAWECKI; Czorsztyn, 18 Sept. 1963 — numerous ♀♀ with eggs; Sromowce Niżne, 19 Sept. 1963 — ♀♀ with eggs.

host: *Populus tremula* L.

loc.: Trzy Korony, 10 Aug. 1936 — ♀♀, leg. et det., Z. KAWECKI; Góra Zamkowa (the massif of Trzy Korony), 9 June 1963 — first and second instar larvae.

host: *Salix* sp.

loc.: Doliny (the Pieniny Czorsztyńskie), 8 June 1963 — first and second instar larvae; Czorsztyn, 19 Sept. 1963 — ♀♀ with eggs.

host: *Cornus mas* L.

loc.: Piekiełko (the Pieniny Czorsztyńskie), 19 Sept. 1963 — ♀♀ with eggs; Podłaźce (the massif of Trzy Korony), 20 Sept. 1963 — ♀♀ with eggs.

host: *Rhamnus cathartica* L.

loc.: Ociemne (the Pieninki), 8 June 1963 — numerous first and second instar larvae; Kras (the Pieninki), 7 July 1963 — young ♀♀.

host: *Acer pseudoplatanus* L.

loc.: Białe Skałki (the Pieninki), 26 June 1963 — first and second instar larvae; Podłaźce (the massif of Trzy Korony), 20 Sept. 1963 — ♀♀ with eggs.

host: *Tilia cordata* MILL.

loc.: Kras (the Pieninki), 7 July 1963 — numerous ♀♀; Czorsztyn, 18 Sept. 1963 — ♀♀ with eggs.

host: *Fraxinus excelsior* L.

loc.: Czorsztyn, 18 Sept. 1963 — numerous ♀♀ with eggs.

This species was reported from Pieniny (ŻAK-OGAZA 1961). Widespread in Poland and in Europe.

SOME REMARKS ON THE BIOLOGY OF THE INVESTIGATED SPECIES

As the result of the investigations carried out throughout the entire vegetation period i. e. from May to October, it was possible to follow the life cycle of most of the collected species of scaled insects (Table I). Common species will not be described as their biology is comparatively well known but only these species which are rarely encountered and whose biology is practically unknown. Some species were observed in their various successive development

stages; others (whose first larva stages are very difficult for field investigation) were reared in the laboratory after collection and in this way the missing data were supplied. But some very rare species were only found once.

The life cycle of the following species was nearly completely determined:

1. *Paroudablis piceae* (Löw)

This species hibernates as a second instar larva. In the second half of September cocoons of second instar larvae were observed on trunks of spruce trees. After hibernation, there appear in spring at the end of April or beginning of May, third instar female larvae, male prepupae and male pupae. Young females were found on needles in the second half of June as well as empty coccons of males. It was not possible to find adult males. In the first half of July adult females were collected just before oviposition (when making preparations eggs were found in the oviducts). The period of hatching of first instar larvae is July and the first half of August, second instar larvae grow at the end of August and the first half of September after which they pass on to the trunks of their host plant for hibernation.

It seems that *P. piceae* (Löw) has only one generation per year on the territory of the Pieniny. Schmutterer (1952) states that in favourable conditions this species may have two to three generations in a year.

2. *Ceroputo pilosellae* Šulc.

This species hibernates as a second instar larva. In the second half of September second instar larvae of various sizes were found; it is possible that in a long and warm autumn some larvae moult and hibernate as third instar larvae. In spring in the second half of April and beginning of May second instar larvae moult and become third instar larvae. In the first half of June only females were observed, which mature in the second half of the month. Adult females collected on 26 June started to giving forth larvae in the laboratory already on the second day — the process lasted about two weeks in one specimen. Probably the period of parturition lasts about a month in natural conditions. The moulting of larvae takes place by the end of August and in September only second instar larvae appear. Males of this species are not known, probably it is parthenogenetic.

3. *Acanthococcus aceris* Sign.

This species hibernates as a second instar larva. In the second half of September motionless second instar larvae were observed on twigs and trunks though they were still leaves on sycomores. When brought into the laboratory, under the influence of the warm temperature they wandered along the twig. At the beginning of May they moult and become adult females; at the same time

Table I

Development Stages of Scale Insects from the Territory of the Pieniny Mts.
(data from 1963)

Species	Months								
	III	IV	V	VI	VII	VIII	IX	X	XI
Newsteadia floccosa de Geer						♀	♀		
Ortheziola veydowskyi Šulc					♀	♀	♀		
Xylococcus filiferus Löw				♀					
Phenacoccus aceris (Geoffr.)			♀	♀, O	l_1	l_1, l_2	l_2	l_2	l_2
Paroudablis piceae (Löw)	l_2	l_2	l_3	♀	♀, O	l_1	l_2	l_2	l_2
P. interruptus (Green)				♀					
Heterococcus borkhsenii Morr.				♀, O					
Brevennia tetrapora Goux				♀, O					
Heliococcus radicicola Goux							l_2	l_2	l_2
Ceroputo pilosellae Šulc	l_2	l_3	l_3, ♀	♀, l_1	l_1	l_1, l_2	l_2	l_2	l_2
Acanthococcus aceris Sign.	l_2	l_2, ♀	♀	♀, O	l_1	l_1, l_2	l_2	l_2	l_2
A. greeni (Newst.)				♀	O	O	O	O	O
Rhizococcus insignis (Newst.)				♀	♀, O	O	O	O	O
Rh. herbaceus Danzig				♀, O	♀, O	O	O	O	O
Greenisca inermis (Green)					l, ♀	♀, O	O	O	O
G. glyceriae (Green)							O	O	O
Fonscolombia fraxini (Kalt.)							l_2	l_2	l_2
Cryptococcus fagisuga Lndgr.				♀					
Luzulaspis luzulae (Dufour)	O	l_1	l_2, l_3	♀	♀, O	O	O	O	O
L. montana Schmutt.						l_3	♀, O	O	O
L. grandis Borchs.						♀	O	O	O
Parafairmairia bipartita (Sign.)					♀, O	O	O	O	O
Eriopeltis festucae (Fonsc.)						♀, O	O	O	O
Pulvinaria betulae (L.)			♀	♀, O	l_1	l_1, l_2	l_2	l_2	l_2
Sphaerolecanium prunastri (Fonsc.)	l_2	l_2, ♀	♀	♀, O	l_1	l_1	l_1, l_2	l_2	l_2
Lecanium corni Bouché	l_2	l_2, ♀	♀	♀, O	l_1	l_1	l_1, l_2	l_2	l_2
L. coryli (L.)	l_2	l_2, ♀	♀	♀, O	l_1	l_1	l_1, l_2	l_2	l_2
L. sericeum Lndgr.	l_2	l_2	♀	♀	♀, O	l_1	l_1	l_1	l_2
Physokermes piceae (Schrk.)				♀, O	l_1	l_1	l_1 l_2	l_2	l_2
Ph. hemicryphus (Dalm.)					♀, O	l_1	l_1		
Dynaspidiotus abietis (Schrk.)							♀		
Quadraspidiotus ostreaeformis (Curt.)							l_2	l_2	l_2
Syngenaspis parlatoriae Šulc							♀, O, l_1		
Lepidosaphes ulmi (L.)	O	l_1	l_1, l_2	♀	♀, O	O	O	O	O
Chionaspis salicis (L.)	O	l_1	l_1, l_2	♀	♀	♀, O	O	O	O

♀ — adult female, l_1 — first instar larva, l_2 — second instar larva, l_3 — third instar larva, O — eggs

the males emerge and fly away. In the first days of June the cocoons of males were empty and adult females in cocoons quite mature. During June females lay eggs in the cocoons. In the laboratory the larvae hatched from eggs collected by the end of June after two weeks; in natural conditions the process might last till the end of July. In the second half of August they moulted and in September there appeared only second instar larvae.

The remaining species of scale insects are shown on Table I, only the line of female development being taken into consideration.

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STRESZCZENIE

W dotychczasowym piśmiennictwie nie znajdujemy opracowania fauny czerwców z terenu Pienin. Jedynie KAWECKI w kilku swoich publikacjach podał 8 gatunków, a ŻAK-OGAZA dalszych 9. W trakcie obecnych badań stwierdzono występowanie gatunków już publikowanych oraz następnych 20, z których 12 jest nowych dla fauny Polski. Ogółem więc na terenie Pienin zarejestrowano 37 gatunków, co stanowi około 55% poznanej fauny czerwców w Polsce.

Należy zaznaczyć, że w obecnych badaniach zajmowano się głównie fauną czerwców występujących w naturalnym środowisku Pienin. Stosunkowo ciekawe wyniki dały poszukiwania na łąkach i polanach oraz badania nad roślinnością naskalną. Z tych też środowisk pochodzi 11 gatunków z 12 nowo wykazanych dla Polski. Są to następujące czerwce: *Ortheziola vejdovskyi* ŠULC, *Paroudablis interruptus* (GREEN), *Heterococcus borkhsenii* MORR., *Brevennia tetrapora* GOUX, *Heliococcus radicicola* GOUX, *Acanthococcus greeni* (NEWST.), *Greenisca inermis* (GREEN), *G. glyceriae* (GREEN), *Luzulaspis montana* SCHMUTT., *L. grandis* BORCHS., *Parafairmairia bipartita* (SIGN.).

Z czerwców związanych z naturalnymi zespołami leśnymi Pienin należy wymienić gatunki żyjące na jodłach, świerkach, bukach, lipach, jaworach. Będą to przede wszytkim takie gatunki, jak: *Lecanium graniforme* (WÜNN), *L. sericeum* LNDGR., *Physokermes piceae* (SCHRK.), *Ph. hemicryphus* (DALM.), *Syngenaspis parlatoriae* ŠULC (ten ostatni nowy dla Polski), *Xylococcus filiferus* LÖW, *Acanthococcus aceris* SIGN., *Cryptococcus fagisuga* LNDGR.

Z gatunków pospolicie występujących w Polsce południowej odnotowano w Pieninach między innymi: *Lecanium corni* BOUCHÉ, MARCHAL (♀ nec ♂), *L. coryli* (L.) sensu MARCHAL nec ŠULC, *Sphaerolecanium prunastri* (FONSC.),

Pulvinaria betulae (L.), *Phenacoccus aceris* (Geoffr.), *Chionaspis salicis* (L.), *Lepidosaphes ulmi* (L.) i *Quadraspidiotus ostreaeformis* (Curt.). Wszystkie te gatunki występują w Pieninach w nielicznych populacjach [wyjątek stanowi *Chionaspis salicis* (L.)].

Z uwagi na to, że obserwacje autorów prowadzone były w całym okresie wegetacyjnym, został uchwycony cykl rozwojowy większości zebranych gatunków. Odpowiednie dane ujęto w tabeli I. Dla szeregu gatunków podano nowe dane z ich biologii.

РЕЗЮМЕ

В литературе нет до сих пор описания фауны кокцид Пенин. Лишь Кавецки в нескольких своих работах приводит 8 видов, а Жак-Огаза дальнейшие 9. В результате настоящих исследований авторы установили наличие видов уже описанных, а также 20 видов из которых 12 являются новыми в фауне Польши. В итоге на территории Пенин зарегистрировано 37 видов, что составляет ок. 55% известной фауны кокцид в Польше.

Следует подчеркнуть, что в настоящих исследованиях занимались главным образом фауной кокцид естественной среды Пенин. Интересные результаты дали исследования лугов, лесных полян и скальной растительности. Здесь обнаружено 11 видов из 12 новых в фауне Польши. Это следующие виды: *Ortheziola veydovskyi* Šulc, *Paroudablis interruptus* (Green), *Heterococcus borkhsenii* Morr. *Brevennia tetrapora* Goux, *Heliococcus radicicola* Goux, *Acanthococcus greeni* (Newst.), *Greenisca inermis* (Green), *G. glyceriae* (Green), *Luzulaspis montana* Schmutt., *L. grandis* Borchs., *Parafairmairia bipartita* (Sign.).

Из кокцид приуроченных к естественным лесным сообществам Пенин следует назвать виды обитающие на пихтах, елях, буках, липах и платанах. Прежде всего это виды: *Lecanium graniforme* (Wünn), *L. sericeum* Lndgr., *Physokermes piceae* (Schrk.), *Ph. hemicryphus* (Dalm.), *Syngenaspis parlatoriae* Šulc (этот последний является новым в Польше), *Xylococcus filiferus* Löw, *Acanthococcus aceris* Sign., *Cryptococcus fagisuga* Lndgr.

Из повсеместно встречающихся видов в Польше отмечено в Пенинах следующие виды: *Lecanium corni* Bouché, Marchal (♀ nec ♂), *L. coryli* (L.) sensu Marchal nec Šulc, *Sphaerolecanium prunastri* (Fonsc.), *Pulvinaria betulae* (L.), *Phenacoccus aceris* (Geoffr.), *Chionaspis salicis* (L.), *Lepidosaphes ulmi* (L.) и *Quadraspidiotus ostreaeformis* (Curt.).

Все эти виды обнаружены в Пенинах в немногочисленных популяциях (исключением является *Chionaspis salicis* (L.). В виду того, что наблюдения авторы проводили в течение всего вегетационного периода, был послежен цикл развития большинства собранных видов, что изображено на прилагаемой таблице. Для ряда видов приведены новые данные по их биологии.

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